# FACT SHEET

U.S. Environmental Protection Agency, Region 10
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Seattle, Washington 98101
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Permit No: AK-004320-6 Date: February 9, 1998

PROPOSED REISSUANCE OF A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE POLLUTANTS PURSUANT TO PROVISIONS OF THE CLEAN WATER ACT (CWA)

KENNECOTT GREENS CREEK MINING COMPANY
P.O. Box 32199
Juneau, Alaska 99803-2199

has applied for reissuance of an NPDES permit to discharge pollutants pursuant to provisions of the CWA. The fact sheet includes a) the tentative determination of the Environmental Protection Agency (EPA) to reissue the permit, b) information on public comment, public hearing and appeal procedures, c) the description of the current discharge, d) a listing of tentative effluent limitations and other conditions, and e) a sketch or detailed description of the discharge locations. We call your special attention to the technical material presented in the latter part of this document.

Persons wishing to comment on the tentative determinations contained in the proposed reissuance may do so by the expiration date of the Public Notice. All written comments should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the expiration date of the Public Notice, the Director, Office of Water, will make final determinations with respect to the permit reissuance. The tentative determinations contained in the draft permit will become final conditions if no substantive comments are received during the Public Notice period.

If no substantive comments are received, the permit will become effective immediately. If comments are received, the permit will become effective 30 days after the final determinations are made, unless a request for an evidentiary hearing is submitted within 30 days after receipt of the final determinations.

The proposed NPDES permit and other related documents are on file and may be inspected at the above address any time between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies and other information may be requested by writing EPA at the above address to the attention of the NPDES Permits Unit. The draft permit and fact sheet are also available from the EPA Alaska Operations Offices in Juneau (410 Willoughby Avenue, Suite 100, Juneau, Alaska 99801) and Anchorage (Federal Building, 222 W. 7th Avenue, Suite 19, Anchorage, Alaska 99513), or the Alaska Department of Environmental Conservation in Juneau (410 Willoughby Avenue, Suite 105, Juneau, Alaska 99801).

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## LIST OF ACRONYMS

| | |
|---|---|
| ADEC | Alaska Department of Environmental Conservation |
| BAT | Best Available Technology Economically Achievable |
| BCT | Best Conventional Pollutant Control Technology |
| BMP | Best Management Practices |
| BOD | Biochemical Oxygen Demand |
| BPT | Best Practicable Control Technology |
| CFR | Code of Federal Regulations |
| DMR | Discharge Monitoring Report |
| DTF | Dry Tailings Facility |
| EPA | Environmental Protection Agency |
| GPM | gallons per minute |
| GPD | gallons per day |
| KGCMC | Kennecott Greens Creek Mining Company |
| MGD | million gallons per day |
| ML | Minimum Level |
| MSA | Mine Services Area |
| NPDES | National Pollutant Discharge Elimination System |
| NTR | National Toxics Rule |
| TPD | tons per day |
| TSD | Technical Support Document (EPA 1991) |
| TSS | Total Suspended Solids |
| TU | Toxic unit ($TU_c$ = acute toxic unit, $TU_c$ = chronic toxic unit) |
| USFS | United States Forest Service |
| WET | Whole Effluent Toxicity |

## INTRODUCTION

EPA proposes to reissue the NPDES permit for the Kennecott Greens Creek Mine located on Admiralty Island near Juneau, Alaska. The NPDES permit will cover discharges from two outfalls into Hawk Inlet. Treated mine and mill wastewaters and storm water associated with operation of the underground lead-zinc mine and mill are discharged via outfall 002. Sanitary wastes from on-site housing are treated and discharged at a separate discharge point (outfall 001).

As part of permit development, EPA has reevaluated all of the effluent limits and monitoring requirements in Greens Creek's existing NPDES permit. The Alaska Department of Environmental Conservation (ADEC) has provided a preliminary determination of the mine's mixing zone which has been used in development of the permit limits. Given the proposed mixing zone, with the exception of arsenic, the water quality-based analysis indicated that the Greens Creek Mine outfall 002 effluent does not have a reasonable potential to exceed water quality standards at the edge of the mixing zone. The proposed permit, therefore, limits wastewater constituents, except arsenic, in the same manner as the current NPDES permit utilizing technology-based criteria. The proposed permit includes water quality-based limits for arsenic which will be included in the final permit unless the EPA rulemaking to remove Alaska from the National Toxic Rule (NTR) for arsenic is finalized. If the EPA rulemaking removes Alaska from the NTR for arsenic, then, based on the marine water aquatic life criteria, an arsenic limitation is not required.

The proposed permit also includes limitations on a small sanitary waste discharge (outfall 001) which was previously covered under a State discharge permit. The proposed permit includes changes to the Best Management Practices Plan requirements, in part to include a greater focus on storm water management and pollution prevention. The toxicity testing and environmental monitoring requirements have also been revised to reflect the monitoring results to date.

The public is invited to comment on the proposed permit and to provide any additional relevant information that should be considered in the final permit determination.

## I. APPLICANT

Kennecott Greens Creek Mining Company:
Mailing Address: Facility Location:
P.O. Box 32199 Latitude 53° 07' 0" ; Longitude 134° 44' 30"
Juneau, Alaska 99803-2199 Admiralty Island
Contact: Bill Oelklaus, Environmental Affairs Supervisor
(907) 789-8170

NPDES Permit No.: AK-004320-6

## II. ACTIVITY

The Kennecott Greens Creek Mining Company (hereafter "KGCMC") currently operates the Greens Creek Mine located on the Admiralty National Monument approximately 18 miles southwest of Juneau, Alaska. The U.S. Forest Service, Tongass National Forest, Chatham Area is responsible for management of Admiralty National Monument. The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) designated most of the monument as wilderness. While the majority of the project is located within the monument, no wilderness land is affected. The mine has been in operation since early 1989 with a period of shutdown between April 1993 and August 1996. At an average production rate of 1300 to 1600 tpd, KGCMC predicts an additional 18 year mine life (as of 1997).

The project area, covers approximately 273 acres and includes the following major components: Mine Services Area, waste rock storage areas, dry tailings facility, a marine terminal and storage area on Hawk Inlet, and roads connecting these components. The location of the operations and major facility components are shown in Figures 1 and 2 (see Appendix A), respectively. Figure 3 (Appendix A) depicts the wastewater quantities and flow paths associated with each component. The facility components and wastewater management associated with each component is summarized below.

**Mine Services Area (MSA):** Lead-zinc ore is mined via underground methods and conveyed to the surface Mine Services Area (MSA) for milling. Milling includes crushing, wet grinding and flotation (with the addition of reagents, including sodium cyanide). Sodium cyanide is destroyed in the flotation circuit by the addition of hydrogen peroxide. The milling processes serve to concentrate the lead and zinc minerals, as well as associated silver minerals and gold, from the mined ore. The concentrate is thickened, filtered, and trucked approximately 8.5 miles to the Hawk Inlet terminal for shipment off-site. The remaining non-concentrated ore material (tailings) are thickened. A portion of the tailings (approximately 70%) are used as underground mine backfill. The remaining tailings are filtered and trucked to the dry tailings facility (DTF) for disposal.

Most of the process wastewater collected from tailings thickening and filtration is recycled for reuse in the milling process. However, a portion of the wastewater must be "purged" from the system to maintain a suitable water chemistry for flotation performance. This purged wastewater is treated in a recently constructed 800 gallon per minute (gpm) treatment plant at the MSA. Treatment consists of ferrous iron co-precipitation, flocculation, and clarification. The treated effluent is piped to the newly constructed Tank 6 at the dry tailings facility (DTF) for further treatment prior to discharge. Solids (sludge) removed from the MSA treatment plant clarifier are added to the tailings thickeners and, therefore, are ultimately disposed in the underground mine as backfill and in the DTF.

Other activities/facilities at the MSA include production of the mine backfill, power plant operations, fuel storage, equipment maintenance and repair, and personnel offices. Other sources of wastewater from the MSA include domestic wastewater (after treatment in a package plant), surface run-off water, and water collected from the underground mine. These wastewaters are diverted through sediment basins and then flow to a pond (Pond A) near the MSA for storage. Overflow from Pond A is piped to Tank 6 at the DTF.

**Waste Rock Storage Areas:** Permanent storage areas for development rock and waste rock (rock that is removed from the mine in order to gain access to the ore) are located adjacent to the MSA. Seepage and run-off from these storage piles are collected in ponds (Pond 23 and Pond D) directly below the piles; overflow from Ponds 23 and D is piped to combine with the piped flow from Pond A prior to its discharge to the DTF.

**Dry Tailings Facility (DTF):** A 29-acre dry tailings facility (DTF) is located in the upper end of the Tributary Creek drainage, approximately 8 miles northwest of the MSA. The "dry" tailings (which still contain 9 to 11 % moisture) trucked from the MSA are compacted behind an earth rock dam. A sedimentation pond (Pond 6) downstream of the tailings pile collects seepage from the tailings pile and runoff from the tailings basin watershed. Pond 6 wastewater is pumped to Tank 6 which also receives wastewater from the MSA (treated mill wastewater and Pond A wastewater), from the waste and development rock storage areas, and from the Hawk Inlet terminal area (run-off and truck wash water). The Tank 6 wastewater is treated at a second recently constructed 800 gpm treatment plant prior to discharge. The treatment process is the same as that used for the mill process water; however, additional neutralization is required to adjust the acidity of the wastewater. When necessary, the treated effluent is filtered through an 1800 gpm filtration plant. The treated effluent is discharged through NPDES outfall 002 as described in Section III. Sludge from the treatment plant clarifier is thickened, filtered, and disposed of in the tailings pile.

**Hawk Inlet Marine Terminal:** The Hawk Inlet marine terminal is used for storing and ship-loading the flotation concentrates and off-loading and storage of supplies. Run-off and truck wash-down from the terminal area are collected in a sediment pond then piped to Tank 6 at the DTF.

KGCMC maintains a shift housing and a dining hall at the old cannery site adjacent to the Hawk Inlet terminal. Domestic wastewaters from the shift housing are treated by a small extended aeration treatment plant and discharged through a separate outfall (outfall 001) into Hawk Inlet. Chlorine is added to the treated effluent prior to discharge. The treatment plant was upgraded in 1997 to increase the capacity of the extended aeration unit. The plant operates in batch mode of about 1100 gallons per discharge event, with five or six discharges occurring each day.

## III. RECEIVING WATERS

The Greens Creek facility wastewaters described above are discharged to Hawk Inlet, adjacent to Chatham Strait (see Figure 1). Hawk Inlet and Chatham Strait are classified by the Alaska State Water Quality Standards as Classes 2(A)(I)(ii)(iii), 2(B)(I)(ii), C and D. The waters are designated for all uses: i.e., aquaculture, seafood processing, and industrial water supply uses; water contact and secondary recreation uses; growth and propagation of fish, shellfish, other aquatic life and wildlife; and, harvesting for consumption of raw molluscs or other raw aquatic life. The Greens Creek facility utilizes two separate discharges into Hawk Inlet, designated as Outfalls 001 and 002:

**Outfall 001:** Domestic wastewater from a small extended aeration plant are discharged from the Hawk Inlet marine terminal area through an outfall to Hawk Inlet. The outfall is located in about 40 feet of water at latitude 58° 07' 30" N and longitude 134° 45' 15" W.

**Outfall 002:** Treated wastewater from the DTF is discharged through a 160-foot long, 14-inch diameter diffuser to Hawk Inlet. The diffuser lies along a submarine slope; the shallow end located at a water depth of approximately 45 feet MLLW and the offshore end at a depth of approximately 69 feet MLLW. The diffuser is inspected by divers semi-annually and inspection reports are submitted to ADEC and EPA. The discharge point, designated as outfall 002, is at latitude 53° 07' 0" N and longitude 134° 44' 30" W. The width of Hawk Inlet (at low tide) at the discharge location is approximately 1120 feet.

## IV. DISCHARGE COMPOSITION

Section II and Figure 3 describe the sources, flow paths, and quantities of wastewater discharged by the Greens Creek Mine. The chemical and physical composition of the discharges are summarized in this section. The following pollutants were reported by the permittee (included in their NPDES application) as being present in the discharge. The toxic and conventional pollutant categories are defined in the regulations (40 CFR 401.15 and 401.16). The category of nonconventional pollutants includes all pollutants not listed in either of the other categories.

**Outfall 001:** Outfall 001 discharges treated sanitary wastes from the Hawk Inlet terminal area

at a maximum rate of 7000 gallons per day (7000 gpd). The following pollutants are present in the treated sanitary waste discharge:

Conventional Pollutants: biochemical oxygen demand (BOD), total suspended solids (TSS), pH, oil and grease, and fecal coliform.

Toxic Pollutants: none

Nonconventional Pollutants: chemical oxygen demand (COD), total organic carbon (TOC), temperature, ammonia, chlorine, nitrate-nitrite, total organic nitrogen, total phosphorous, and sulfate.

**Outfall 002:** As discussed in Section II, the sources of wastewater that are discharged via outfall 002 include: underground mine water, treated mill wastewater, run-off from the MSA and Hawk Inlet marine terminal areas, domestic wastewater from the MSA, and seepage and run-off from the dry tailings facility and waste rock storage sites. The quantity (flow rates) of each of these individual sources is shown in Figure 3. The total discharge rate of outfall 002 is a long-term average of 0.82 mgd and maximum daily flow rate of 2.5 mgd. The following pollutants are present in the outfall 002 discharge.

Conventional Pollutants: BOD, TSS, pH, oil and grease, and fecal coliform.

Toxic Pollutants: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, and cyanide.

Nonconventional Pollutants: COD, TOC, temperature, ammonia, nitrate-nitrite, total organic nitrogen, total phosphorous, manganese, sulfate, sulfide, chloride, and iron.

## V. BACKGROUND

### A. Permit History

NPDES Permit No. AK-004320-6 was first issued to the facility on March 31, 1987 before production commenced in early 1989. The NPDES permit expired on April 29, 1992. A timely application for renewal of the permit was submitted to EPA on October 22, 1991. On September 11, 1995 a revised application was submitted. The revised application was necessary to reflect KGCMC's plan for increased production and modifications to the wastewater treatment system. The revised application also incorporates discharges from outfall 001.

The existing NPDES permit has been administratively extended and, therefore, the existing permit remains fully effective and enforceable until reissuance.

Outfall 001 is currently regulated under a state permit (State Discharge Permit #8712-DB007) that was last issued on July 6, 1989. The State has not renewed this permit, preferring to include the 001 discharge in the NPDES permit. In order to consolidate the permits, the requirements and limitations for outfall 001 are included in this proposed NPDES permit.

## B. Outfall 002 Effluent Limitations and Monitoring in the Existing NPDES Permit

**Effluent Limitations and Monitoring:** The current effluent limits for outfall 002 are shown in the second and third columns of Table 1 (page 6). The metals limits are technology-based; the cyanide limit is water quality-based. A State of Alaska certification condition on the existing permit required compliance with water quality criteria at the edge of a defined mixing zone. These criteria are identified in the last two columns of Table 1. All parameters included in Table 1 are monitored on a weekly basis, except for flow (continuous), temperature (daily), turbidity (continuous), and pH (daily). As required by the permit, these data are reported by KGCMC in the monthly Discharge Monitoring Reports (DMRs).

The existing NPDES permit requires whole effluent toxicity (WET) testing using final treated outfall 002 effluent at three dilution concentrations. Acute static bioassays have been required quarterly since mining operations began, then semi-annually after April of 1993. The permit requires 96-hr, $LC_{50}$ testing of a salmonid smolt, an amphipod, and a crustacean. Substitute species were provided for in the permit dependent upon availability of test species during different seasons. WET testing results are discussed in Section VI.D.

**Ambient Monitoring:** The current permit requires quarterly ambient seawater sampling from five locations in Hawk Inlet. The locations were selected to represent background and the edge of the mixing zone (to verify the calculated mixing zone and that state water quality criteria are met outside the mixing zone). The current permit also includes ambient monitoring of sediment collected semi-annually from four locations in Hawk Inlet and quarterly in-situ bioassays. The objective of the in-situ bioassays is to determine whether heavy metals in the permitted discharges are impacting the tissues of the intertidal filter feeder population. The bioassays are performed on *Mytilus edulis* (mussel), *Laqueus californianus* (brachiopod), and *Nepthys procera* (polychaete) collected at four locations in Hawk Inlet and Chatham Strait. Evaluation of results of the ambient monitoring indicate that, since mine operation began, concentrations of zinc in sediment have increased in at least one area near outfall 002. However, the zinc concentrations are less than the Washington State Sediment Management Standards (there are no sediment standards for Alaska). Concentrations of arsenic and lead in some of the tissues have increased from pre-operational levels at locations near the discharge. As required for state certification, KGCMC will conduct a screening-level risk assessment to demonstrate that these increases do not adversely impact ecological or human health.

| TABLE 1: EXISTING NPDES PERMIT LIMITS - Outfall 002 | | | | |
|---|---|---|---|---|
| **Parameter** | **Outfall 002 Effluent Limitations[1] (total recoverable)** | | **ADEC Receiving Water Permit Limitations[2]** | |
| | **Monthly Average** | **Daily Maximum** | **24-hr. Average** | **Daily Maximum** |
| Flow (mgd) | 1.66 | 3.6 | -- | -- |
| Cadmium (mg/l) | 0.05 | 0.10 | 0.010 | 0.010 |
| Copper (mg/l) | 0.15 | 0.30 | 0.004 | 0.023 |
| Lead (mg/l) | 0.3 | 0.6 | 0.007 | 0.007 |
| Mercury (mg/l) | 0.001 | 0.002 | 0.000025 | 0.0037 |
| Zinc (mg/l) | 0.5 | 1.0 | 0.058 | 0.170 |
| Free Cyanide (µg/l) [3] | 2.65 | 5.3 | 0.3 | 0.3 |
| SS (mg/l) | 20.0 | 30.0 | -- | -- |
| Arsenic (mg/l) | -- | -- | 0.005 | 0.005 |
| Chromium (mg/l) | -- | -- | 0.018 | 1.26 |
| Nickel (mg/l) | -- | -- | 0.007 | 0.140 |
| Selenium (mg/l) | -- | -- | 0.010 | 0.010 |
| Silver (mg/l) | -- | -- | 0.0023 | 0.0023 |
| Manganese (mg/l) | -- | -- | -- | -- |
| Chloride (mg/l) | -- | -- | -- | -- |
| Temperature ($^{o}$C) | -- | -- | -- | -- |
| Turbidity (NTU) | -- | -- | -- | -- |
| pH (standard units) | Between 6.0 - 9.0 | | -- | -- |

**1**: The limitations for cadmium, copper, lead, mercury, and zinc are based on EPA effluent guidelines for best available technology economically achievable (BAT), 40 CFR 440.103. The pH and SS limitations are based on best practicable control technology (BPT), 40 CFR 440.102.
**2**: These criteria apply at the edge of the mixing zone.
**3**: Free cyanide was derived as a water quality-based limit, with a safety factor of 100 and dilution factor of 265:1.

## C. Outfall 001 Effluent Limitations and Monitoring in the State Permit

The current expired State permit for outfall 001 includes effluent limitations on total flow (90 gpd daily average and 750 gpd daily maximum) and pH (between 6.0 and 9.0). The permit prohibits the discharge of floating solids, garbage, grease or foam in other then trace amount, or oily wastes which produce a sheen on the surface of the receiving waters. Monitoring requirements are limited to the collection of effluent samples for fecal coliform analysis (four times/year).

## D. Compliance History - Outfall 002

In November of 1989, EPA Region 10 issued the facility an administrative complaint related to 116 permit violations of copper, zinc, lead, cyanide, and pH limits that occurred between February 1989 and September 1989. This complaint was resolved through a Consent Order on June 21, 1990. The Consent Order assessed a penalty of $50,000 (which was paid in a timely manner) and required the facility to achieve final compliance with all permit limitations by December 31, 1990. Sporadic violations, however, continued after that date. From January 1991 through September of 1995, 242 violations of pH limits and 17 violations of metals limits occurred. EPA referred these violations to the Department of Justice (DOJ). On June 25, 1997, a Consent Decree was finalized which required KGCMC to pay a $300,000 penalty for these violations. This penalty was paid in a timely manner.

Because of low ore prices, KGCMC temporarily ceased mining and milling operations between April 1993 and August of 1996. During this time, KGCMC made numerous improvements to their wastewater management. The major improvements included: installation of two wastewater treatment systems (as described in Section II) for both the mill process water and the DTF water; increased wastewater storage to provide capacity for increased production and potential overflow containment; and, modifications to the dry tailings pond. The wastewater treatment systems have been fully operational since September 1996; since that time compliance with permit limits has improved.

## VI. PROPOSED PERMIT CONDITIONS (Effluent Limitations)

In developing the proposed permit conditions, EPA has evaluated the concentrations of the pollutants in the wastewater sources relative to the levels allowed under federal regulations and the Alaska Water Quality Standards.

### A. General Approach

Sections 101, 301(b), 304, 308, 401, and 402 of the Clean Water Act ("the Act" or CWA) provide the basis for the effluent limits and other conditions in the draft permit. EPA evaluates discharges with respect to these sections of the Act and the relevant NPDES regulations to determine which conditions to include in the permit.

In general, EPA first determines which technology-based limits are required, as well as best management practices or other requirements. EPA then evaluates the effluent quality expected to result from these controls, to determine if the effluent could result in any exceedences of water quality standards in the receiving water. If exceedences could occur, EPA must include water quality-based limits in the permit. The permit limits will thus reflect whichever limits (technology-based or water quality-based) are most stringent. The development of technology-based and water quality-based effluent limitations are described below.

## B. Technology-Based Evaluation

### 1. Statutory Basis for Technology-Based Limits

The Act requires categories of industrial dischargers to meet the effluent limitations established by EPA. The Act initially focused on the control of "traditional pollutants" (conventional pollutants and some metals) through the use of best practicable technology (BPT). Industries were required by Section 301(b)(1)(A) of the Act to meet this level of control by July 1, 1977. Section 301(b)(3) of the Act allowed a deadline of March 31, 1989, under certain circumstances, but that deadline has also passed. Thus, permits issued after March 31, 1989, must include any conditions necessary to ensure that the BPT level of control is achieved.

Section 301(b)(2) and (3) of the Act require further technology-based controls on effluents. After March 31, 1989, all permits are required by Section 301(b)(2) and (3) to contain effluent limitations for all categories and classes of point sources which: (1) control toxic pollutants and nonconventional pollutants through the use of best available technology economically achievable (BAT) and (2) represent best conventional pollutant control technology (BCT) for conventional pollutants. In no case may BCT or BAT be less stringent than BPT.

### 2. Technology-Based Effluent Limitation Guidelines (Outfall 002)

Federal Effluent Guidelines applicable to the Greens Creek Mine discharge are found in 40 CFR Part 440, Subpart J - Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory. EPA previously determined that the mine is not a "new source", but is a new discharger. Therefore the EPA national effluent guidelines that apply to this permit reissuance are 40 CFR 440.103 (BAT) and 40 CFR 440.102 (BPT). The BAT and BPT guidelines have the same numerical effluent limits for metals. These technology-based limitations for cadmium, copper, lead, mercury, and zinc are shown in the second and third columns of Table 1 (Section V.B of this fact sheet). The BPT guideline limits for TSS and pH are also shown in Table 1.

### 3. Technology-Based Permit Requirements (Outfall 001)

Domestic wastewater from the Hawk Inlet terminal area is treated prior to discharge with the use of a package-plant capable of performing secondary treatment. State regulations require secondary treatment of domestic wastewater unless a reduced treatment level is established by ADEC in response to a request by the applicant. Secondary treatment is defined in both the state regulations (Alaska Wastewater Disposal regulations, 18 AAC 72) and in federal regulations (40 CFR Part 133) as a monthly average limit of 30 mg/l and weekly average limit of 45 mg/l for $BOD_5$ and TSS. Federal regulations (40 CFR 133.102) also require a technology-based pH limitation of 6.0 to 9.0 standard units.

## C. Water Quality-Based Evaluation

1. Statutory Basis for Water Quality-Based Limits

Section 301(b)(1)(C) of the Act requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977. Discharges to state waters must also comply with limitations imposed by the state as part of its certification of NPDES permits under section 401 of the Act.

The NPDES regulation at 40 CFR 122.44(d)(1) implementing Section 301(b)(1)(C) of the Act requires that permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality." The regulations require that this evaluation be made using procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available waste load allocation.

The regulations also specifically address when whole effluent toxicity (WET) and chemical-specific limits are required. A WET limit is required whenever toxicity is at a level of concern relative to either a numeric or narrative standard for toxicity. The only exception is where chemical-specific limits will fully achieve the narrative standard. A chemical-specific limit is required whenever an individual pollutant is at a level of concern relative to the numeric standard for that pollutant.

2. Water Quality Criteria

The first step in developing water quality-based limits is to determine the applicable water quality criteria. The applicable criteria are determined based on the beneficial uses of the receiving water (Hawk Inlet) as identified in Section III of this fact sheet. The most stringent of the water quality criteria applicable to the Greens Creek Mine discharges are shown in Table 2. These criteria are based on the Alaska Water Quality Standards (18 AAC 70). The Alaska Water Quality Standards adopted federal water quality criteria by reference from a variety of sources. As well as the Alaska standards, the sources of the criteria shown in Table 2, include:

- *The Quality Criteria for Water* (EPA 1976) also referred to as the “Red Book” (RB in Table 2) contains applicable saltwater aquatic criteria for cyanide and human health criteria for manganese.

- The November 28, 1980 Federal Register Notice (45 FR 79318) contains applicable saltwater aquatic life criteria for copper, nickel, silver, and zinc and human health criteria for mercury and nickel (referred to as FR 1980 in Table 2).

- The July 29, 1985 Federal Register Notice (50 FR 30784) contains applicable saltwater

aquatic life criteria for arsenic, cadmium, chromium, copper, cyanide, lead, and mercury (referred to as 1985 FR in Table 2).

- EPA promulgated saltwater acute aquatic life criteria and human health criteria for Alaska in the December 22, 1992 Federal Register Notice (59 FR 60848): Water Quality Standards, Establishment of Numerical Criteria for Priority Toxic Pollutants, States Compliance Final Rule, hereafter referenced as the National Toxics Rule (NTR). The NTR contains the applicable saltwater aquatic life criteria for nickel, selenium, and zinc and human health criteria for arsenic and cyanide.

**Table 2: Applicable Water Quality Criteria**
**(metals expressed in terms of total recoverable; metals units in µg/l)**

| Parameter | Marine Water Aquatic Life Criteria | | | | Human Health Criteria | |
|---|---|---|---|---|---|---|
| | Acute | | Chronic | | | |
| | Criteria | Source | Criteria | Source | Criteria | Source |
| Arsenic | 69 | 1985 FR | 36 | 1985 FR | 1.4 | NTR |
| Cadmium | 43 | 1985 FR | 9.3 | 1985 FR | -- | -- |
| Chromium | 1100 | 1985 FR | 50 | 1985 FR | -- | -- |
| Copper | 2.9 | 1985 FR | 4.0 | 1980 FR | -- | -- |
| Cyanide | 1 | 1985 FR | 5.0 | RB | 220,000 | NTR |
| Lead | 140 | 1985 FR | 5.6 | 1985 FR | -- | -- |
| Manganese | -- | -- | -- | -- | 100 | RB |
| Mercury | 2.1 | 1985 FR | 0.025 | 1985 FR | 0.146 | 1980 FR |
| Nickel | 75 | NTR | 7.1 | 1980 FR | 100 | 1980 FR |
| Selenium | 300 | NTR | 71 | NTR | -- | -- |
| Silver | 2.3 | 1980 FR | -- | -- | -- | -- |
| Zinc | 95 | NTR | 58 | 1980 FR | -- | -- |
| pH | 6.5 - 8.5 standard units, from Alaska Standards (18 AAC 70) | | | | | |
| chlorine | 2.0 µg/l for salmonid and 10.0 µg/l for other organisms, from Alaska Standards | | | | | |
| fecal coliform | median: 14 FC/100 ml maximum: 43 FC/100 ml from Alaska Standards | | | | | |

In response to a petition from ADEC, EPA is proposing a rulemaking to remove Alaska from the NTR for the human health criterion for arsenic. At the time of publication of this fact sheet, the rulemaking has not yet been finalized, therefore the fact sheet and proposed permit take into account the NTR value for arsenic. However, since the rule may be finalized prior to finalization of this NPDES permit, this fact sheet also evaluates arsenic under the scenario of the final rule (i.e., if the State is removed from the NTR for the arsenic criteria, then the most stringent arsenic criteria becomes the chronic marine aquatic life criteria of 36 µg/l).

3. Reasonable Potential Determination

To determine if permit limits are needed for individual pollutants, EPA compares the applicable water quality criteria to the maximum expected receiving water concentration for the particular pollutant. If the expected receiving water concentration exceeds the criteria, a limit must be included in the permit. EPA uses the recommendations in Chapter 3 of the *Technical Support Document for Water Quality-Based Toxics Control* (TSD, 1991) to conduct this analysis.

The maximum expected receiving water concentration is calculated based on dilution (if available), the background receiving water concentration (if available), the maximum reported effluent concentration, and a multiplier to account for uncertainty. The multiplier is used to statistically generate a maximum expected effluent concentration from the maximum reported concentration. The multiplier deceases as the number of data points and variability of the data decrease. Variability is measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value.

4. Permit Limit Development

Water quality-based effluent limits are developed for those parameters that (after following the procedures in the previous section) exhibited a reasonable potential to exceed water quality criteria. In deriving the water quality-based limits, EPA applies the statistical permit limit derivation approach described in Chapter 5 of the TSD. This approach takes into account the waste load allocation (WLA) and effluent variability in setting limits which are low enough to ensure that the water quality standards are met.

The WLA is the concentration (or loading) of a pollutant that may be discharged by the permittee without causing or contributing to a violation of water quality standards in the receiving water. The WLA is calculated based on the available dilution (mixing zone), if appropriate, background receiving water concentrations, and the water quality standards. Generally, separate WLAs are calculated for each water quality criteria: acute aquatic life, chronic aquatic life, and human health. If there is no dilution available (the State has not authorized a mixing zone), the water quality criterion becomes the WLA. The most stringent WLA for each parameter is then used to calculate permit limits. Because the different water quality criteria apply over different time frames, it is not possible to compare them directly to determine which criterion results in the most stringent limits. To allow for comparison, each criterion is statistically converted to a long-term average effluent concentration. This conversion is dependent upon the CV of the effluent data and the probability basis used. The probability basis corresponds to the percentile of the estimated concentrations. EPA uses a 99th percentile for calculating a long-term average, as recommended in the TSD. Based on this analysis, the criterion that results in the most stringent long-term average effluent concentration is the WLA that is used to calculate permit limits.

The most stringent WLA is then used to calculate permit limits for each parameter. The WLA is

statistically converted to a daily maximum and monthly average permit limit based on the CV of the data, probability basis, and frequency of monitoring. As recommended in the TSD, EPA used a probability basis of 95 percent for the monthly average limit calculations and 99 percent for the daily maximum limit calculations.

Development of the limitations for each parameter are discussed in Section D, below, for outfall 002 and Section E for outfall 001. The water quality-based calculations are shown in Appendix B.

## D. Specific Conditions for Outfall 002

This section describes how the technology-based and water quality-based evaluations resulted in specific numerical limits for each parameter in outfall 002.

The determination of numerical effluent limitations for each parameter was accomplished through consideration of technology-based limits (as was discussed in Section VI.B.2) and evaluation of the need for water quality-based limits (as was discussed in Section VI.C). The following information was used for the water quality-based evaluation (i.e, to determine reasonable potential and calculate effluent limits):

Background Data: Background concentrations for each parameter were calculated based on the last ten years of Hawk Inlet water quality monitoring data.

Effluent Data: EPA utilized effluent data reported in KGCMC's DMRs for the period from the last 16 months of continuous operation (January 1992 through April 1993). January 1992 marks the date that the original mill wastewater treatment system became fully operational, so effluent data collected before that time was not representative of future conditions (i.e., not useful in determining permit limitations). Since the mine is just recently reaching capacity after restarting in August 1996, continuous representative data is not available since it ceased operations in April of 1993.

Mixing Zone: ADEC has tentatively designated a mixing zone for outfall 002 for the protection of aquatic life. The mixing zone represents a 170:1 dilution. The dilution was derived using the PLUMES and CORMIX dilution models, and EPA's probability model to determine "reasonable potential" of the projected effluent to cause exceedences of water quality criteria in Hawk Inlet. The pollutant requiring the greatest dilution to meet water quality standards was lead**.** Because the background level of arsenic was only slightly less than the water quality criteria, the mixing zone calculation did not take into account the dilution needed to meet the arsenic water quality standard at the edge of a mixing zone. A description of how the mixing zone was calculated will be included in the 401 certification from ADEC. If the preliminary determination for the mixing zone is changed by ADEC, then EPA will recalculate effluent limitations for the final permit.

The reasonable potential and water quality-based effluent limit calculations are shown in Appendix B. Following is a description of the limits proposed for each parameter.

Flow: EPA proposes to retain the flow limits in the current permit. These limits are a daily maximum of 3.6 mgd and monthly average of 1.66 mgd. These limits are retained since the new wastewater treatment systems were designed for these flows and these flows were used in the dilution (mixing zone) modeling. The Greens Creek Mine has consistently achieved compliance with these limits.

TSS: The proposed permit retains limitations for suspended solids (as TSS) from the existing permit (30 mg/l maximum daily and 20 mg/l monthly average). These limitations are based on the BPT limitations. There have been no exceedences of these limits during the years of operation.

pH: In the current permit, the limit for pH requires the effluent to be within the range of 6.0 to 9.0 standard units (technology-based guideline). The current State water quality standard for pH is 6.5 to 8.5 standard units. Given the proposed 170:1 mixing zone, there is no reasonable potential for pH to exceed water quality standards at the edge of the mixing zone, therefore, a water quality-based limit is not required and the proposed permit retains the technology-based pH limit. Effluent from outfall 002 has exceeded the technology-based pH limits in the current permit. These violations and KGCMC's resolution of the problems were discussed previously in Section V.D of this fact sheet. The improvements in wastewater treatment and management of the tailings pond should enable the facility's discharge to meet the pH limitation.

Metals: The data used to determine reasonable potential and the reasonable potential calculations (following the procedures described in Section VI.C) for each metal in the outfall 002 discharge are summarized in Appendix B. Given the proposed 170:1 dilution, only arsenic demonstrated a reasonable potential to violate water quality standards beyond the mixing zone. Since there was no reasonable potential for any of the other parameters to violate water quality criteria, the existing technology-based (BAT) limitations apply to applicable parameters. Technology-based limits are available for cadmium, copper, lead, mercury, and zinc.

The reasonable potential evaluation indicated that there is a potential for arsenic to exceed water quality standards at the edge of the mixing zone. The water quality standard that would be exceeded was the NTR human health criteria of 1.4 µg/l. Water quality-based limitations were calculated based on the NTR criteria and resulted in an average monthly limit of 6.8 µg/l and maximum daily limit of 13.7 µg/l. Should the final EPA rulemaking (as discussed in Section VI.C.2), remove Alaska from the NTR for the arsenic human health criteria, then the existing aquatic life criteria apply and per the reasonable potential analysis, the discharge does not exhibit a reasonable potential to exceed the criteria. Therefore, arsenic would not be limited in outfall 002 under this scenario. The reasonable potential evaluation for both of the arsenic scenarios is shown in Appendix B along with the permit limit calculations applicable to the current NTR criteria.

Cyanide: The existing permit contains water quality-based limitations for free cyanide. However, the applicable water quality criteria require measurement of cyanide as total. The 1990 Consent Order discontinued use of the end-of-pipe free cyanide limit, pending modification of the permit to establish a total cyanide limit. The reasonable potential calculation indicated that the discharge does not have a reasonable potential to exceed cyanide water quality standards (measured as total) at the edge of the 170:1 mixing zone (see Appendix B). Therefore, the proposed permit does not include a limitation for cyanide. The total cyanide monitoring is retained to continue providing assurance that no reasonable potential exists.

Whole Effluent Toxicity (WET): As was done for the other parameters, EPA has reviewed the outfall 002 effluent discharge WET database to determine whether there is a reasonable potential for the receiving water concentration to exceed the water quality standard at the edge of the proposed mixing zone. Alaska's water quality standard for WET (18 AAC 70.030) states that effluent must not cause chronic toxicity, defined as 1.0 chronic toxic unit ($TU_c$), in the receiving water at the point of discharge or beyond a mixing zone boundary. Since the State has no acute toxicity standard, EPA has assumed 0.3 acute toxic unit ($TU_a$) as the acute WET criteria, per guidance in the TSD.

Normally, $LC_{50}$ or $IC_{25}$ data for the most sensitive species (for Greens Creek, Salmonid sp. smolts collected since 1996) is used to determine reasonable potential following procedures prescribed in the TSD. KGCMC has performed 96-hr effluent toxicity testing semi-annually since 1991 at 50:1, 100:1, and 200:1 dilutions (which correspond to 2%, 1%, and 0.5% effluent). The currently proposed mixing zone dilution for outfall 002 is within this range (170:1). Test results indicate no acute toxicity at these dilutions. Toxicity survival tests have always shown 80% or greater survival at all test dilutions, indicating that effluent toxicity levels are sufficiently below the $LC_{50}$ level. These results indicate that it is unlikely that there is a reasonable potential for the discharge WET to violate the standards at the edge of the 170:1 mixing zone. However, because of the lack of a true $LC_{50}$ endpoint, an exact reasonable potential calculation cannot be accurately determined at the present time. Therefore, toxicity testing will continue, replacing the acute testing with chronic testing. The specific toxicity test requirements proposed are described in Section VII.B. If the additional toxicity testing indicates reasonable potential to exceed the WET State water quality standards, the permit may be reopened to include an acute and/or chronic WET limit, as appropriate.

**SUMMARY:** The following table summarizes the proposed effluent limitations and monitoring requirements for the effluent discharged from Outfall 002. These limitations are based on the preliminary 170:1 mixing zone proposed by the State. Should the final mixing zone change, the reasonable potential evaluation will be repeated and final permit limits may change.

**Table 3: Proposed Effluent Limitations and Monitoring Requirements for Outfall 002**

| Effluent Parameter [1] (units) | Effluent Limitation | Monitoring Requirements |
|---|---|---|

| Table 3: Proposed Effluent Limitations and Monitoring Requirements for Outfall 002 | | | | | |
|---|---|---|---|---|---|
| | Average Monthly Limit | Maximum Daily Limit | basis for limit | frequency | sample type |
| Flow (mgd) | 1.66 | 3.6 | -- | continuous | recorder |
| Arsenic [2] (µg/l) | 6.8 | 13.7 | water quality | weekly | 24-hour composite |
| Cadmium (µg/l) | 50 | 100 | technology | weekly | 24-hour composite |
| Copper (µg/l) | 150 | 300 | technology | weekly | 24-hour composite |
| Lead (µg/l) | 300 | 600 | technology | weekly | 24-hour composite |
| Mercury (µg/l) | 1.0 | 2.0 | technology | weekly | 24-hour composite |
| Zinc (µg/l) | 500 | 1000 | technology | weekly | 24-hour composite |
| TSS (mg/l) | 20 | 30 | technology | weekly | 24-hour composite |
| pH (standard units) | between 6 - 9 SU | | technology | daily | grab |
| Total Cyanide (µg/l) | -- | -- | -- | weekly | grab |
| WET ($TU_c$) | -- | -- | -- | semi-annually | 24-hour composite |
| Turbidity (NTU) | -- | -- | -- | continuous | recorder |
| Temperature ($^oC$) | -- | -- | -- | daily | grab |

**1:** Mercury shall be measured as total, all other metals shall be reported as "total recoverable"
**2:** The arsenic limits will be deleted if EPA finalizes the rulemaking to remove Alaska from the NTR for arsenic before finalization of the permit.

## E. Specific Conditions for Outfall 001

Outfall 001 consists solely of domestic wastewater discharged from the cannery shift housing at the Hawk Inlet terminal. The wastewater is subject to secondary treatment and chlorination. The existing permit contains limitations on flow and pH. The proposed permit revises the pH limit to reflect Alaska water quality standards. The proposed permit includes technology-based limits for BOD and TSS, based on the Alaska Wastewater Disposal regulations (18 AAC 72).

The proposed permit includes water quality-based limits for fecal coliform and chlorine, based on Alaska Water Quality Standards (18 AAC 70). ADEC has tentatively designated a 100 meter mixing zone for outfall 001 for fecal coliform. The 100 meter mixing zone equates to a dilution of 500:1, therefore the fecal coliform effluent limits were calculated by multiplying the water quality standards (see Table 2) by 500. A description of how the mixing zone was determined will be included in the 401 certification from ADEC. If the preliminary determination for the mixing zone is changed by ADEC, then EPA will recalculate fecal coliform effluent limits for the final permit.

Monthly average and daily maximum chlorine limits were calculated based on the 2.0 µg/l water quality standard and do not include dilution afforded by a State authorized mixing zone. These calculations are shown in Appendix B. The calculated chlorine limits fall below the capability of current analytical technology to detect and/or quantify. EPA's draft guidance, *National Guidance*

*for the Permitting, Monitoring, and Enforcement of Water Quality-Based Effluent Limitations Set Below Analytical Detection/Quantification Levels* (March 1994), outlines objectives for achieving consistency in establishing permit limitations for pollutants that are set below detection levels. This guidance specifies that, regardless of the ability to measure to the level of the permit limit, the value provided for the effluent limits in the permit should be expressed as the calculated limit. The inability to measure to the necessary level of detection is addressed by establishing the Minimum Level (ML) as the quantification level for use in laboratory analysis and for reporting DMR data for compliance evaluations. In the absence of promulgated MLs, Interim MLs should be used. The Interim ML is approximated by 3.18 times the published method detection limit rounded to the nearest 1, 2, 5, 10, 20, 50, etc. Based on the method detection limit of 10 µg/l, the Interim ML for chlorine is 20 µg/l. The Interim ML will be used as the compliance evaluation level for chlorine. The proposed permit limitations for Outfall 001 are shown in Table 4.

**Table 4: Proposed Effluent Limitations and Monitoring Requirements for Outfall 001**

| Effluent Parameter | Effluent Limitation | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| | Average Monthly Limit | Average Weekly Limit | Maximum Daily Limit | frequency | sample type |
| Flow (gpd) | -- | -- | -- | daily | measure |
| $BOD_5$ (mg/l) | 30 | 45 | -- | weekly | grab |
| TSS (mg/l) | 30 | 45 | -- | weekly | grab |
| Total Residual Chlorine [1] (µg/l) | 1.6 | -- | 3.3 | weekly | grab |
| Fecal Coliform (colonies/100 ml) | 7000 | -- | 21500 | weekly | grab |
| Temperature (°C) | -- | -- | -- | weekly | grab |
| pH | between 6.5 - 8.5 SU | | | weekly | grab |

**1**: The limits for chlorine fall below the Interim ML of 20 µg/l. The Interim ML shall be used as the compliance evaluation level for chlorine.

## VII. MONITORING REQUIREMENTS

Under Section 308 of the Act and 40 CFR 122.44(I), EPA must require a discharger to conduct monitoring whenever necessary to determine compliance with effluent limitations, assist in the development of effluent limitations, and assess the quality of receiving waters. Monitoring frequencies are based on the nature and effect of the pollutants, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The proposed permit contains both effluent monitoring and ambient environmental monitoring requirements.

### A. Outfall Monitoring

The monitoring requirements (parameters, frequency, and sample type) for outfalls 001 and 002 are shown in Tables 4 and 3, respectively. The monitoring requirements for outfall 002 are the same as in the current permit for those parameters that are limited (see Table 3). Monitoring for

total cyanide has been retained to ensure that no reasonable potential to exceed water quality criteria at the edge of the mixing zone continues to exist. Monitoring for turbidity and temperature has been retained as they supply useful water quality information. Monitoring for the metals that are not limited (chromium, nickel, selenium, silver, and manganese) has been discontinued. This reduction in monitoring of non-limited parameters is consistent with EPA's *Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies* (April 1996).

The expired State permit required monitoring outfall 001 for fecal coliform only. This proposed permit increases the monitoring requirements to include monitoring for flow, temperature, and each limited parameter (see Table 4).

## B. Outfall 002 Toxicity Testing

Toxicity testing provides an indication of the composite effluent potential toxicity. The acute toxicity testing included in the existing NPDES permit never indicated lethal toxicity at the dilutions tested (and the dilutions tested bracket the proposed mixing zone), therefore the acute tests will be discontinued. Chronic toxicity testing, which measures sublethal effects, was not included in the current permit, but is included in the proposed permit. The WET of the outfall 002 effluent will be monitored by chronic toxicity testing using two different invertebrate test species. The seawater/effluent dilutions tested are revised to reflect the new mixing zone dilution (corresponds to 0.6 % effluent) allowed under the proposed permit. WET testing will occur on a semi-annual basis. Specifics of the bioassay requirements are given in Table 5.

**Table 5: Bioassay Monitoring Requirements (semi-annual)**

| Bioassay Test Organism | Test Type (and endpoint) | Effluent Dilutions |
|---|---|---|
| Mytilis spp. (mussel) - or - Crassostrea gigas (oyster) | 48-hour static non-renewal (larval development) | 0.6 %<br>two dilutions > 0.6 %<br>two dilutions < 0.6 %<br>control |
| Strongylocentrotus purpuratus (urchin) - or - Dendraster excentricus (sand dollar) | 40-minute static non-renewal (fertilization) | |

## C. Environmental Monitoring

### 1. Introduction

The draft permit requires the permittee to continue ambient monitoring at selected locations within and around the discharge areas. Monitoring of benthic organisms, the water column and sediments will occur in Hawk Inlet. The environmental monitoring requirements differ slightly

from the requirements in the previous permit, as discussed in the following media-specific sections.

The goal of the ambient monitoring program is to establish data that is representative of the potential exposure pathways to the marine environment in the vicinity of the discharges and allow assessment of the hypothesis that state water quality criteria are not exceeded at the edge of the designated mixing zone and that no adverse accumulation occurs in sediments and tissues of aquatic organisms potentially affected by the facility's discharges. The focus of the environmental monitoring is the area around outfall 002, since this outfall has a greater influence on the environmental quality of Hawk Inlet than the sanitary wastewater discharge from outfall 001. The environmental monitoring locations for each medium are shown in the attachment to the draft permit.

2. Ambient Seawater Monitoring

Begun in 1982, under joint development of EPA, ADEC, and Greens Creek, the current ambient monitoring program has established sampling stations that cover a range of conditions for background seawater in Chatham Strait and Hawk Inlet. The monitoring frequency included in the existing permit is retained. The parameters being monitored have been reduced to match those that are included in the outfall 002 monitoring requirements. Two sampling locations (locations 104 and 105) have been deleted. Location 104 is no longer useful since it does not represent a true background location as originally expected. Location 105, which is outside the boundary of the existing mixing zone is not pertinent to the new proposed smaller mixing zone. The ambient seawater monitoring included in the proposed permit is shown in Table 6.

**Table 6: Water Column Monitoring Requirements (quarterly)**

| Sample Location | Parameter [1] | |
|---|---|---|
| 106 (Chatham Strait - background) | Arsenic | TSS (mg/l) |
| | Copper | pH (SU) |
| 107 (mid-channel/Hawk Inlet near outfall 001) | Cadmium | Total Cyanide |
| | Lead | Temperature ($^{o}$C) |
| 108 (above outfall 002 diffuser) | Mercury | Conductivity (umhos) |
| | Zinc | Turbidity (NTU) |

**1** - All parameters to be measured in ug/l, except as noted. All the metals shall be measured as total recoverable, except for mercury which will be measured as total.

3. Sediment Monitoring

The proposed permit continues semi-annual sediment monitoring to assess the effect of mine discharges on sediments within Hawk Inlet. The sediment monitoring frequency is the same as in the existing permit. The parameters are reduced consistent with the outfall 002 monitoring parameters. Monitoring location S-3 has been deleted. Location S-3 is in the same area as

seawater location 104 and has been removed from the proposed permit for the same reasons. The following table provides the sediment sampling locations and parameters.

| Table 7: Sediment Monitoring Requirements (semi-annual) | |
|---|---|
| Sample Location | Parameter (total, in mg/kg) |
| S-1 (near outfall 002) | Arsenic<br>Cadmium<br>Copper<br>Lead<br>Mercury<br>Zinc |
| S-2 (south Hawk Inlet - background) | |
| S-4 (ore loading facility) | |
| S-5 (ship berth) | |

4. In-Situ Bioassays

In-situ bioassay monitoring was established in the previous permit to determine relative toxicities from the Greens Creek discharges to the Hawk Inlet marine environment. This monitoring program has been carried over from the existing permit with the following changes: minor modifications of the test species, deletion of several monitoring parameters to match the proposed effluent limitations, and deletion of one sampling location (station S-3 was dropped for the reasons discussed in the previous section). Table 8 identifies the proposed sampling locations and in-situ test organisms.

| Table 8: In-Situ Monitoring Requirements (semi-annual) | | |
|---|---|---|
| Sample Location | In-Situ Test Organism | Parameters (total in mg/kg) |
| S-1 (near outfall 002) | Sediment Dwellers (test two species):<br><br>Nepthys procera (polychaete)<br><br>Nereis sp. (polychaete) - or other local species if Nereis is not available | Body Burden Analyses for:<br><br>Arsenic<br>Cadmium<br>Copper<br>Lead<br>Mercury<br>Zinc |
| S-2 (south Hawk Inlet - background) | | |
| S-4 (ore loading facility) | | |
| S-5 (ship berth) | | |
| Stn 1 (near outfall 002 diffuser) | Filter Feeder:<br><br>Mytilus edulus (bay mussel) | |
| Stn 2 (entrance to Hawk Inlet) | | |
| Stn 3 (fjord wall west of outfall 002) | | |
| ESL (east shoal light piles) | | |

## D. Storm Water Monitoring Program

Storm water from the Greens Creek operations is currently discharged pursuant to the Multi-Sector Storm Water General Permit. However, because KGCMC would prefer to incorporate storm water discharges into the individual NPDES permit (and therefore have all discharges covered under one permit), the draft permit includes storm water monitoring. In February 1997, ADEC and KGCMC reviewed the storm water sites to determine which sites should be included in the proposed NPDES permit The storm water locations identified by ADEC as requiring monitoring and the monitoring objectives are listed in Table 9. Each of the locations will be monitored during episodic events (spring snowmelt/runoff, the fall "monsoon" months in Southeast) because they do not have measurable flows most other times of the year.

The storm water discharges should not adversely affect water quality. This assumes appropriate design and implementation of best management practices (BMPs). The monitoring described in Table 9, along with periodic inspections, are required to evaluate the effectiveness of BMPs and to provide sufficient information to determine if these discharges either cause or contribute to water quality standards violations. Storm water effluent limitations have not been incorporated into the draft permit, however, if a significant source(s) is identified, EPA may reopen the permit to include specific effluent limitations, additional monitoring requirements, and/or specific additions to the BMP Plan to reduce the pollutant discharge(s).

## Table 9: STORM WATER MONITORING PROGRAM

Sampling Frequency: 2 times/year, once with the first spring storm or snow-melt event and one during fall peak rainfall. In the event of a "dry" fall with low storm water flows, no sample will be required until the next spring.
Sample Type: Grab

| Site Number | Location(s) of Site & Pollution Prevention Plan Site Numbers | Monitoring Objective | Sampling Parameters |
|---|---|---|---|
| 003 | Southern part of Hawk Inlet facilities area near the "cannery" buildings | To monitor site runoff from parking and storage areas not otherwise captured and handled through NPDES Outfall 002. This runoff routes to the beach area of Hawk Inlet | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 004 | Pit 7: active rock quarry off of A-Road at mile 1.8<br>(KGCMC Site 520SW) | To measure effects of drainage from rock extraction pit (sediments and equipment traffic) near wetlands. | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 005 | KGCMC road system:<br>A-Road from Hawk Inlet to Young Bay (5 mi.) & B-Road from Hawk Inlet to 1350 mine portal (13 mi.) | Overall objective for monitoring road system is to measure effects from traffic on maintained gravel road, including haulage of metal concentrates and tailings. | Per sub-sites below |
| 005.1 | Pit 5: active rock quarry and loading/unloading area off of B-Road at mile 0.8<br>(KGCMC site 530SW) | To measure effects of drainage from rock extraction pit, material/equipment/topsoil storage area, and waste water treatment facilities. | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 005.2 | Zinc Creek Bridge (west side) off of B-Road at mile 3.0<br>(KGCMC site 539SW) | The Zinc Creek bridge site includes fill from a road cut through a mineralized zone. Objectives to monitor road runoff and potential leaching from mineralized zone. | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 005.3 | Site E: inactive waste rock storage area off of B-Road at mile 4.5 | To measure effects of drainage from road runoff and inactive production rock placement site. | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 005.4 | Pit 6: inactive rock quarry and top soil storage off of B-Road at mile 4.6<br>(KGCMC site 547SW) | To measure effects of drainage from inactive quarry site and topsoil storage area. | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 005.5 | Culvert at B-Road mile 7.8 | To measure effects of drainage from road runoff. | Oil & Grease<br>Lead, Zinc<br>TSS, pH |
| 006 | Pond D: sediment pond from inactive waste rock storage area D off of B-Road at mile 8.0. | To measure effects of drainage from storm water runoff from inactive production rock placement site. NOTE: base flow and most storm water from this site is collected and discharged through NPDES Outfall 002. | Lead, Zinc<br>TSS, pH |
| 007 | Pond C: sediment pond from inactive waste rock storage area C off of B-Road at mile 8.2. | To measure effects of drainage from storm water runoff from inactive production rock placement site, and active mine associated facilities. | Lead, Zinc<br>TSS, pH |
| 008 | 980 Laydown site for initial portal development rock | To measure effects of drainage from storm water runoff from inactive development rock placement site. | Lead, Zinc<br>TSS, pH |
| 009 | Site 1350 adit inactive waste rock storage area | To measure effects of drainage from storm water runoff from inactive development rock placement site. | Lead, Zinc<br>TSS, p |

## VIII. OTHER PERMIT CONDITIONS

### A. Best Management Practices Plan

Federal regulations at 40 CFR 122.44(d)(1) state that permits shall include any requirements in addition to or more stringent than promulgated effluent limitation guidelines or standards under Sections 301, 304, 306, 307, 318, and 405 of the CWA necessary to achieve water quality standards established under Section 303 of the CWA. Additional best management practices (BMPs) can be incorporated into NPDES permits when the practices are reasonably necessary to carry out the purposes of the CWA [40 CFR 122.44(k)].

The existing permit requires the development and implementation of a best management practices (BMP) Plan. Since issuance of the existing permit, the BMP Plan has been amended several times, most recently in 1997 when the Plan of Operations was revised. The BMP Plan has been the subject of significant attention by Greens Creek and the U.S. Forest Service primarily due to the location of the mine in the Admiralty National Monument.

The proposed permit continues and expands the BMP requirements in order to encompass recent developments in pollution prevention, as discussed below. A revised BMP Plan must be submitted to EPA and ADEC within six months of the effective date of the permit. The revised Plan must reflect final permit conditions and include the revised storm water monitoring requirements of the storm water aspects of this permit. The revised BMP Plan must also incorporate elements of pollution prevention as set forth in the Pollution Prevention Act of 1990. (42 U.S.C. 13101) and is intended to achieve the following objectives: minimize the quantity of pollutants discharged from the facility, reduce the toxicity of discharges to the extent practicable, prevent the entry of pollutants into waste steams, and minimize storm water contamination.

The BMP Plan must be amended whenever there is a change in the facility or in the operation of the facility which materially increases the potential for an increased discharge of pollutants. The elements of the BMP Plan become enforceable permit conditions.

### B. Quality Assurance Requirements

Under 40 CFR 122.41(e) the permittee must properly operate and maintain all facilities which are used by the permittee to achieve compliance with the conditions of the permit. This regulation also requires the permittee to ensure adequate laboratory controls and appropriate quality assurance procedures. Quality assurance requirements apply to all permit required monitoring, including sample collection, handling, and shipment, on-site continuous and daily measurements, laboratory analysis, and data reporting and storage.

A Quality Assurance Project Plan (QAPP), dated May 1996, was prepared by KGCMC to fulfill these obligations. The draft permit requires KGCMC to revise the QAPP to reflect the final

permit requirements (e.g., changes in the toxicity testing requirements, monitoring locations, etc.) in accordance with EPA-approved quality assurance and quality control procedures. The revised QAPP is due to EPA and ADEC within 60 days of the effective date of the permit.

Through implementation of the QAPP, the permittee is required to ensure the data quality of its contract laboratories used to determine compliance with the permit. The permittee shall amend the QAPP, whenever there is a modification in the sample collection and analysis procedures, changes in the laboratories used, or any conditions/requirements that are not specified in the existing QAPP. The conditions and requirements specified in the QAPP are part of the permit. Non-compliance with the conditions and requirements of the QAPP shall constitute non-compliance with the permit.

### C. Unauthorized Discharges

In order to clarify permittee responsibilities regarding the potential discharge of pollutants and/or waste streams not listed in the permit application, the permit expressly prohibits discharges of waste streams that are not part of the normal operation of the facility as disclosed in the permit application and its attachments (e.g., the BMP Plan).

## IX. OTHER LEGAL REQUIREMENTS

### A. Endangered Species Act

In compliance with Section 7 of the Endangered Species Act, a list of endangered and threatened species for the affected area was requested from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). NMFS identified the following endangered and threatened species that occur or may occur in the area:

Endangered Species:

Humpback Whale (*Megaptera novaeangliae)*
Snake River Sockeye Salmon (*Onocorhynchus nerka)*

Threatened Species:

Stellar Sea Lion (*Eumetopias jubatus*)
Snake River spring/summer chinook salmon (*Onorhynchus tshawytscha*)
Snake River fall chinook salmon (*Onorhynchus tshawytscha*)

USFWS identified the American peregrine falcon (*Falco peregrinus anatum*) as an endangered species that may occur in the area. It is not anticipated that discharges covered under this permit will affect the peregrine falcon. During the public comment period, EPA will verify the species listed above and consult with NMFS to determine possible effects on the listed species.

EPA will provide NMFS and USFWS with copies of the proposed permit and fact sheet during the public notice period. Any comments received from these agencies and results of the consultation with NMFS will be considered prior to reissuance of this permit.

## B. Coastal Zone Management Act

The State of Alaska will be reviewing this permit to determine consistency with the Coastal Zone Management Act.

## C. Water Quality Standards and State Certification

In accordance with 40 CFR 124.10(c)(1), public notice of the draft permit has been provided to the State of Alaska agencies having jurisdiction over fish, shellfish, and wildlife resources.

Since state waters are involved in this permitting action, the provisions of Section 401 of the Act apply. The State of Alaska, ADEC, has been involved in developing the proposed permit. The reasonable potential determinations and water quality-based effluent limits are based on the outfall 001 and 002 mixing zones proposed by ADEC. ADEC is reasonably confident that the mixing zones specified will be certified for the final permit (ADEC 1997, letter from M. Conway to P. Milam). If the mixing zones in the final certification are different, the effluent limits will be recalculated accordingly.

This permit is subject to Alaska's antidegradation policy (18 AAC 70.015). The state of Alaska will address the application of this policy to the Greens Creek discharges in their final certification of this permit.

## D. Permit Term

The permit shall expire five years from the effective date of the permit.

## X. REFERENCES

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# APPENDIX A

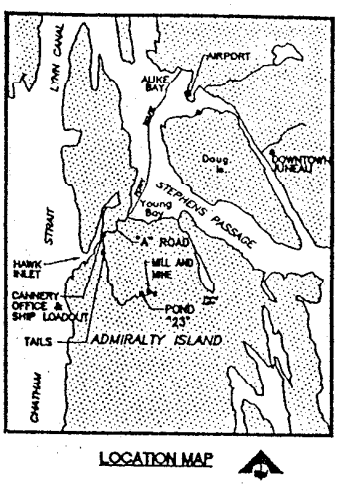
## MAPS AND FIGURES

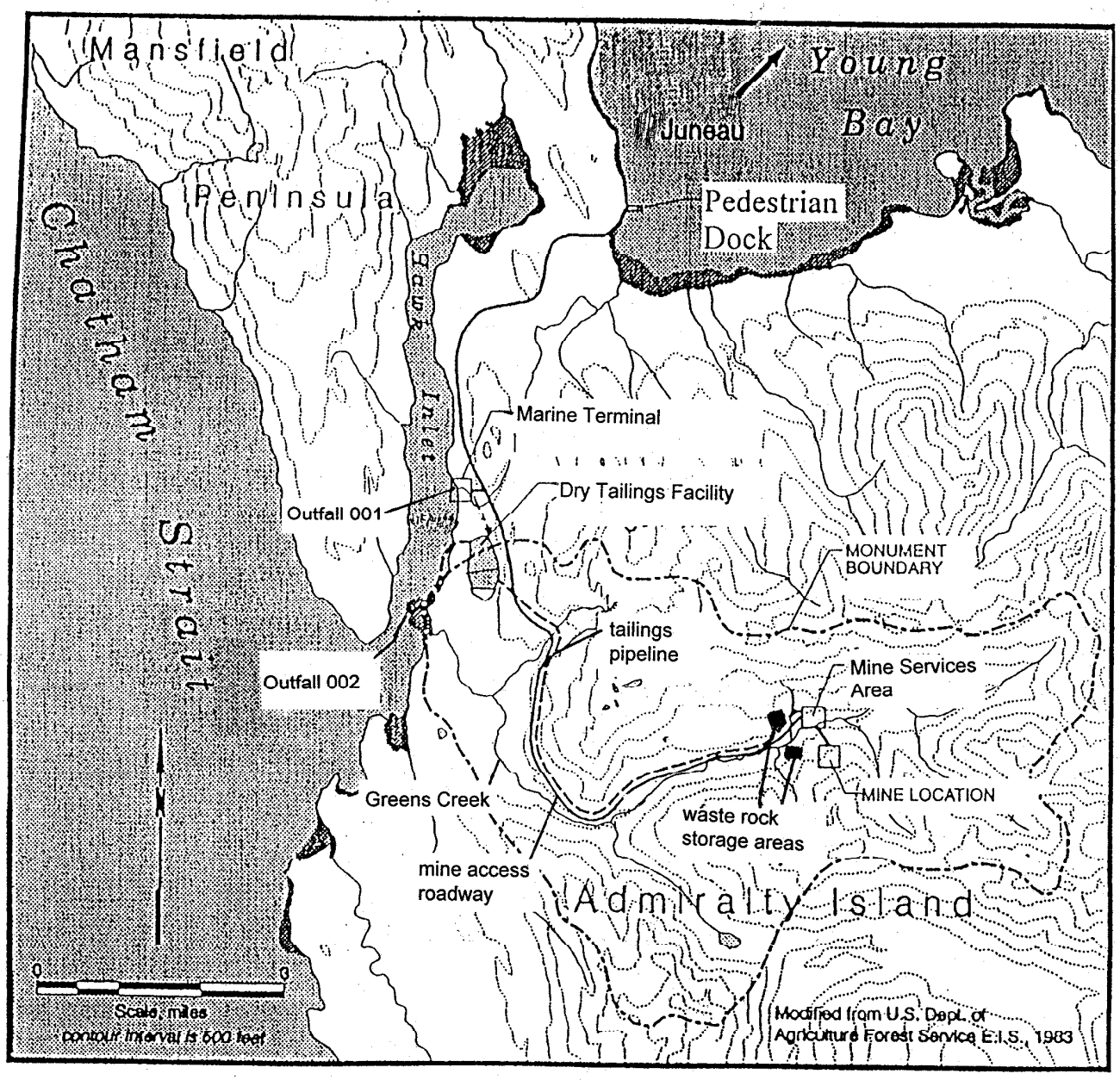
FIGURE 1: Greens Creek Mine Site Map

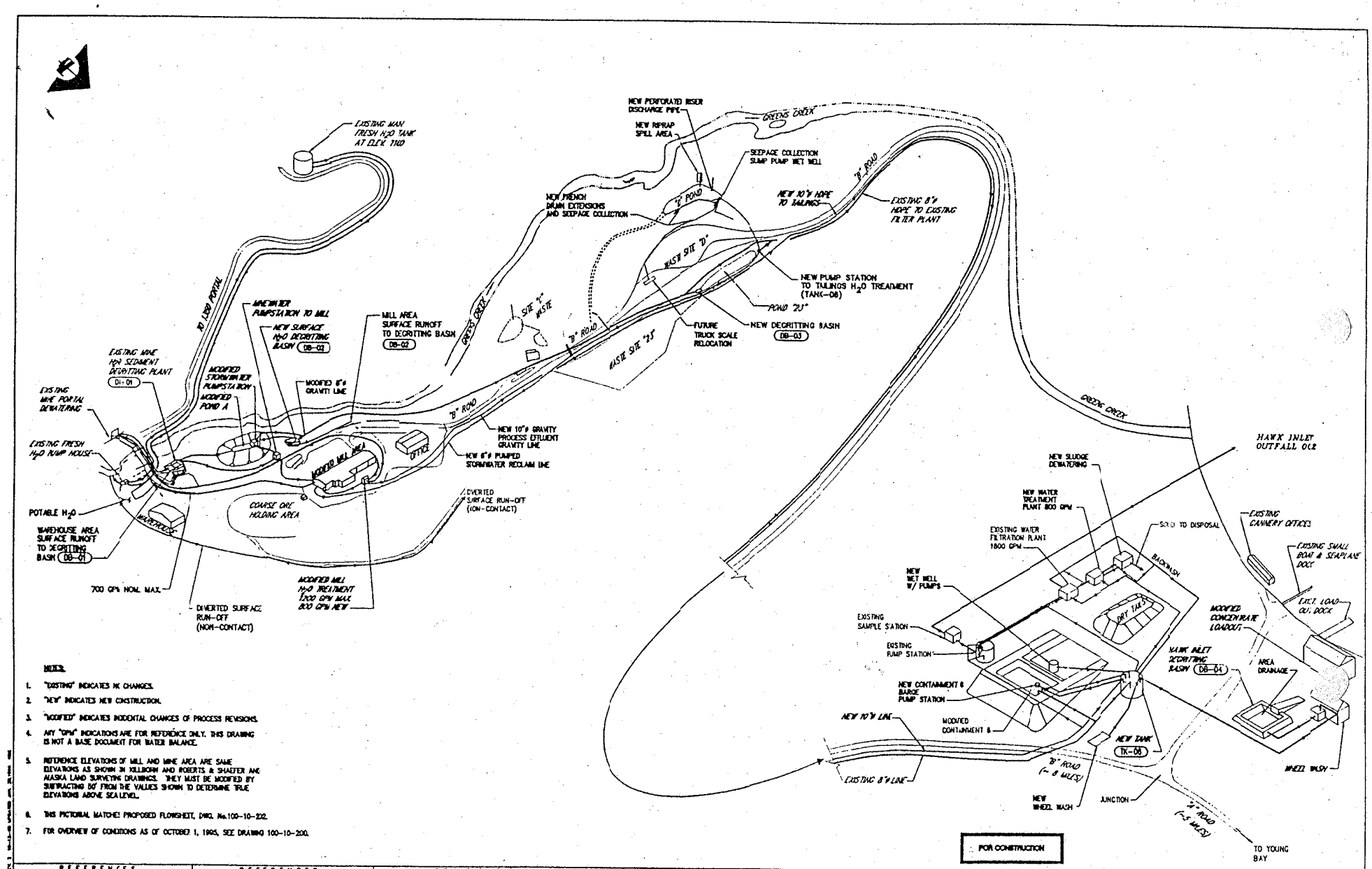
FIGURE 2: Greens Creek Mine General Facilities Map

FIGURE 3: Site Water Balance

FIGURE 1
GREENS CREEK MINE SITE






FOR CONSTRUCTION

NOTES:

1. "EXISTING" INDICATES NO CHANGES.
2. "NEW" INDICATES NEW CONSTRUCTION.
3. "MODIFIED" INDICATES INCIDENTAL CHANGES OF PROCESS REVISIONS.
4. ANY "GPM" INDICATIONS ARE FOR REFERENCE ONLY. THIS DRAWING IS NOT A BASE DOCUMENT FOR WATER BALANCE.
5. REFERENCE ELEVATIONS OF MILL AND MINE AREA ARE SAME ELEVATIONS AS SHOWN IN KILLBORN AND ROBERTS & SHAEFER AND ALASKA LAND SURVEYING DRAWINGS. THEY MUST BE MODIFIED BY SUBTRACTING 80' FROM THE VALUES SHOWN TO DETERMINE TRUE ELEVATIONS ABOVE SEA LEVEL.
6. THIS PICTORIAL MATCHES PROPOSED FLOWSHEET, DWG. No.100-10-202.
7. FOR OVERVIEW OF CONDITIONS AS OF OCTOBER 1, 1995, SEE DRAWING 100-10-200.

| REFERENCES | | | |
|---|---|---|---|
| DWG. NO. | TITLE | DWG. NO. | TITLE |
| | | | |

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | DESCRIPTION | BY | APP'D | DATE | CLIENT |
| | | | | | |

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| NO. | DESCRIPTION | BY | APP'D | DATE | CLIENT |
| 0 | FOR CONSTRUCTION | MJ3 | HUSS/MJ3 | | J.D.D. |
| 1 | REVISE FOR AGENCY COMMENTS | MJ3 | HUSS/MJ3 | | |
| 2 | REVISE ENTIRE DRAWING | MJ3 | HUSS/MJ3 | | |
| 3 | REVISE WATER HANDLING | MJ3 | HUSS/MJ3 | | |

| | | |
|---|---|---|
| SCALE: NONE | | |
| DESIGNED BY: C.E.H. | AUG. 95 | |
| DRAWN BY: I.J.S. | AUG. 95 | |
| CHECKED BY: C.E.H. | 9-13-95 | |
| PROJECT MGR: C.E.H. | 9-13-95 | |
| CLIENT APPR.: J.D.D. | 9-13-95 | |

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GREENS CREEK MINING COMPANY

GENERAL FACILITIES
HAWK INLET TO MINE
GENERAL ARRANGEMENT
PICTORIAL PERSPECTIVE

JOB NO. M3-PN95109
DWG NO. 100-10-204
REV NO. 3
DATE 11/23/95

FIGURE 2
GREENS CREEK MINE GENERAL FACILITIES MAP

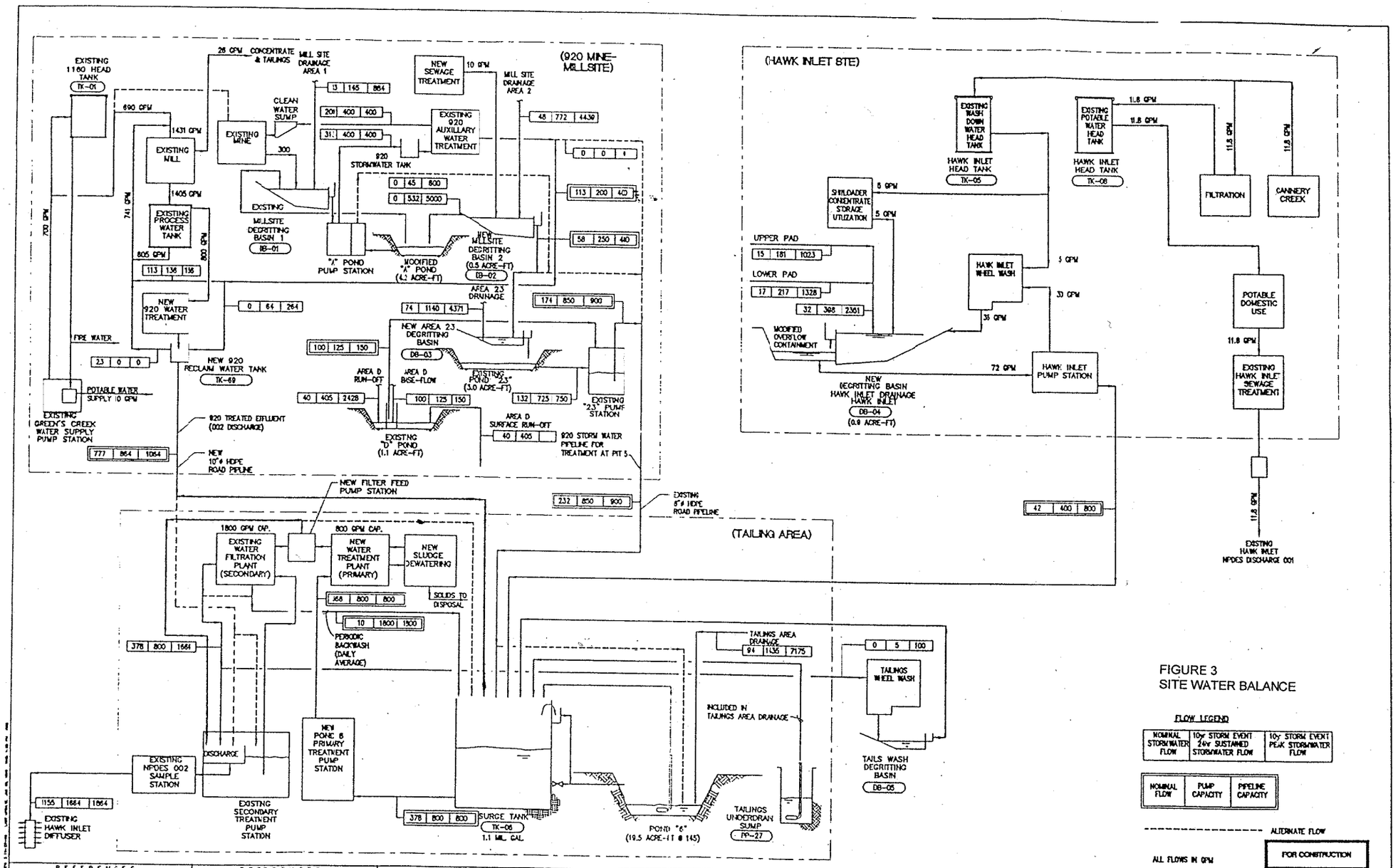


FIGURE 3
SITE WATER BALANCE

| REFERENCES | | REFERENCES | | REVISIONS | | | | | REVISIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DWG. NO. | TITLE | DWG. NO. | TITLE | NO. | DESCRIPTION | BY | APP'D | DATE | CLIENT | NO. | DESCRIPTION | BY | APP'D | DATE | CLIENT | SCALE: NONE | DATE |
| 100-10-201 | CONSTRUCTION FLOWSHEET | | | | | | | | | 0 | FOR CONSTRUCTION | MJ | HUSS | 9/6/95 | J.D.D. | DESIGNED BY JD | AUG. 95 |
| | | | | | | | | | | 1 | REVISED FOR AGENCY COMMENTS | MJ | HUSS | 9/8/95 | J.D.D. | DRAWN BY BJS | AUG. 95 |
| | | | | | | | | | | 2 | REVISED PER P & IDS | MJ | HUSS | 9/12/95 | J.D.D. | CHECKED BY TEH | 9-13-95 |
| | | | | | | | | | | 3 | FINAL 1 SUBMITTAL | MJ | HUSS | 9/13/95 | J.D.D. | PROJECT MGR TEH | 9-13-95 |
| | | | | | | | | | | 4 | REVISIONS AND NAMES | MJ | HUSS | 9/8/96 | J.D.D. | CLIENT APPR. J.D.D. | 9-13-95 |

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GREENS CREEK MINING COMPANY

GENERAL SITE PROCESS AND STORM WATER BALANCE FLOWSHEET POST-CONSTRUCTION

JOB NO. M3-FN95109
DWG NO. 100-10-202
REV NO. 4
DATE 6/8/96

## APPENDIX B

## WATER QUALITY-BASED CALCULATIONS

### I. Reasonable Potential Determination - Outfall 002

A water quality-based effluent limit is necessary if a discharge causes, has reasonable potential to cause, or contributes to an excursion of an applicable numeric water quality criterion. The following calculations were performed for the Greens Creek Outfall 002 discharge to determine whether such a reasonable potential exists. The calculations are based on EPA's Technical Support Document for Water Quality-based Toxics Control (TSD); specifically, Chapter 3 of the TSD.

A reasonable potential exists if the projected maximum receiving water concentration (RWC) exceeds an applicable water quality standard. For discharge into open waters (i.e., Outfall 002):

RWC = [Ce/dilution] + Cb

Ce = maximum effluent concentration multiplied by reasonable potential multiplier
Cb = background receiving water concentration
dilution = dilution allowed by State = 170 for Greens Creek

Ce and Cb are specific to each parameter. Cb's and the maximum effluent concentrations for each parameter are shown in Table B-1, below.

The following steps demonstrate how the reasonable potential is determined, using copper as an example:

Step 1: Calculate Ce. Ce is calculated as follows (using copper as an example):

1 - determine the maximum effluent concentration:
copper = 140 $\mu$g/l (from Table B-1)

2 - determine the coefficient of variation (CV) for copper
CV = standard deviation/mean
CV = 1.1 (based on last 16 months of operating data - 64 data points)

3 - obtain the reasonable potential multiplier, assuming 99% confidence level and 99% probability basis (using equations from the Section 3.3.2 of the TSD):

RP multiplier = $C_{99}/C_x$

where, $C_{99} = \exp (2.326\sigma - 0.5\sigma^2)$

$\sigma = \ln (CV^2 + 1)$

Cx = percentile represented by highest concentration in the data base; 64 samples represents the 93th percentile, and

$C_{93} = \exp (1.48\sigma - 0.5\sigma^2)$

for copper, CV = 1.1, so

$\sigma = 0.872$, and

RP multiplier = 5.20/2.49 = 2.1

4 - calculate Ce: Ce = 2.1 x 140 = 294 $\mu$g/l

Step 2: Determine the RWC

RWC = [Ce/dilution] + Cb for copper, Cb = 0.6 $\mu$g/l (From Table B-1)

RWC = [294/170] + 0.6 = 2.3 $\mu$g/l

Step 3: Determine the Reasonable Potential:

since the RWC (2.3 $\mu$g/l) does not exceed the most stringent applicable water quality standard (2.9 $\mu$g/l), water quality-based effluent limits are not required for copper

Reasonable potential was determined for all the parameters of concern, by the same TSD methodology as described above for copper. A summary of these calculations is given in Table B-1.

**TABLE B-1: DETERMINATION OF REASONABLE POTENTIAL TO EXCEED WATER QUALITY STANDARDS** (all units in $\mu$g/l)

| Parameter | background receiving water concentration[1] | maximum effluent concentration[2] | number of effluent samples[2] | coefficient of variation (CV)[2] | Reasonable potential multiplier[3] | maximum projected receiving water conc. (RWC)[4] | most stringent water quality criteria (from Table 2 of fact sheet) | reasonable potential (yes or no?)[5] |
|---|---|---|---|---|---|---|---|---|
| arsenic | 1.36 | 29 | 64 | 0.6 | 1.6 | 1.6 | 1.4 / 36[6] | yes / no[6] |
| cadmium | 0.08 | 2 | 64 | 0.6 | 1.6 | 0.099 | 9.3 | no |
| chromium (VI) | 0.21 | 25 | 64 | 0.6 | 1.6 | 0.45 | 50 | no |
| copper | 0.6 | 140 | 64 | 1.1 | 2.1 | 2.3 | 2.9 | no |
| cyanide | 0 | 50 | 64 | 1.4 | 2.4 | 0.71 | 1.0 | no |
| lead | 0.106 | 340 | 64 | 1.5 | 2.5 | 5.1 | 5.6 | no |
| manganese | 0 | 350 | 64 | 1.1 | 2.1 | 4.3 | 100 | no |
| mercury | 0.0008 | 0.5 | 64 | 0.6 | 1.6 | 0.006 | 0.025 | no |
| nickel | 0.58 | 25 | 64 | 0.6 | 1.6 | 0.82 | 7.1 | no |
| selenium | 2.8 | 103 | 64 | 0.5 | 1.5 | 3.7 | 71 | no |
| silver | 0.009 | 25 | 64 | 0.6 | 1.6 | 0.24 | 2.3 | no |
| zinc | 1.47 | 500 | 64 | 1.4 | 2.4 | 8.5 | 58 | no |

**1** - Background receiving water values are based upon monthly monitoring results from Hawk Inlet Station 106 between 1985 and 1995. The value for each parameter is the average concentration over the ten year time period.

**2** - Effluent data (maximum reported concentration, number of samples, and CV) are based on the last sixteen months of continuous operation (Jan. 1992 through April 1993). The facility was not in operation between April 1993 and September 1996 (full capacity reached in Dec. 1996)

**3** - RP multiplier = $C_{99}/C_{93}$ = $\exp(2.326\sigma - 0.5\sigma^2) / \exp(1.48\sigma - 0.5\sigma^2)$, where, $\sigma = \ln(CV^2 + 1)$

**4 -** RWC = [(max. effluent conc.) * (RP multiplier)/dilution] + background conc. = [(column 3)(column 6)/170 ] + column 2

**5** - reasonable potential exists if, RWC (column 7) > most stringent water quality criteria (column 8)

**6** - under current scenario, NTR human health criteria for arsenic is the most stringent criteria and a reasonable potential exists; if final EPA rulemaking removes Alaska from the NTR for arsenic, then the aquatic life criteria becomes the most stringent and no reasonable potential exists.

## II. Calculation of Effluent Limits

### A. Outfall 002 - Arsenic Limitations

According to the reasonable potential determination for the Outfall 002 discharge, only arsenic had the reasonable potential to exceed water quality standards outside the approved mixing zone. Therefore, water quality-based effluent limits were calculated for arsenic. The calculations were preformed according to procedures in Chapter 5 of the TSD as outlined below.

Step 1: Calculate Waste Load Allocations (WLAs)

The water quality criteria are converted to WLAs for the receiving water based on the following mass balance equation:

$$WLA = (Cr - Cb) * dilution$$

Cr = criteria that cannot be exceeded at the edge of the mixing zone

$Cr_{acute} = 69\ \mu g/l$
$Cr_{chronic} = 36\ \mu g/l$
$Cr_{human\ health} = 1.4\ \mu g/l$

Cb = background concentration = 1.36 $\mu$g/l for arsenic

dilution = mixing zone dilution allowed by State of Alaska = 170

$$WLA_{acute} = (69 - 1.36) * 170 = 11{,}500\ \mu g/l$$

$$WLA_{chronic} = (36 - 1.36) * 170 = 5890\ \mu g/l$$

$$WLA_{human\ health} = (1.4 - 1.36) * 170 = 6.8\ \mu g/l$$

Step 2: Calculate Long-Term Average (LTAs) concentrations. This step is applicable only to the aquatic life criteria; the human health WLA is directly converted to an average monthly effluent limit.

The acute and chronic WLAs are converted to LTA concentrations using Table 5-1 of the TSD:

$$LTA = WLA * conversion\ factor\ from\ Table\ 5\text{-}1$$

The conversion factor depends upon the CV and the probability statistic used to account for effluent variability.

CV = 0.6 for arsenic (see Table B-1)

per the TSD, the 99th percentile statistic is used for calculation of LTAs

from Table 5-1:

$LTA_{acute}$ = 0.321 * $WLA_{acute}$ = 0.321 * 11,500 = 3690 $\mu$g/l

$LTA_{chronic}$ = 0.527 * $WLA_{chronic}$ = 0.527 * 5890 = 3100 $\mu$g/l

Step 3: Calculate Maximum Daily and Average Monthly Effluent Limits

To protect a water body from both acute and chronic effects, the more limiting of the calculated LTAs is used to derive the effluent limitations. For arsenic, the $LTA_{chronic}$ is more limiting.

The maximum daily limit (MDL) and average monthly limit (AML) are calculated from Table 5-2 of the TSD as follows:

MDL = LTA * conversion factor from Table 5-2
AML = LTA * conversion factor from Table 5-2

The conversion factors depends upon the CV, the probability statistic used to account for effluent variability, and in the case of the AML, the number of samples collected per month.

CV = 0.6 for arsenic (see Table B-1)
per the TSD, probability basis = 95th percentile for the AML
Probability basis = 99th percentile for the MDL
samples per month = 4 (based on permit requirements)

from Table 5-2:

MDL = LTA * 3.11 = 3100 * 3.11 = 9650 $\mu$g/l
AML = LTA * 2.48 = 3100 * 1.55 = 4810 $\mu$g/l

Per the TSD, for the human health criteria, the WLA = AML. Therefore, for arsenic the AML for protection of human health is 6.8 $\mu$g/l. The AML can be converted to the MDL using Table 5-3 of the TSD, where:

MDL = AML * conversion factor

The conversion factor in Table 5-3 depends upon the effluent variability and the numbers of samples collected per month. As above, the probability bases for the AML and MDL are the 95th percentile and 99th percentile, respectively.

from Table 5-3:

MDL = AML * 2.01 = 6.8 * 2.01 = 13.7 $\mu$g/l

Since the AML and MDL based on the human health criteria are more stringent than the AML and MDL based on aquatic life criteria, the human health limitations will be used in the proposed permit. Therefore, for arsenic:

AML = 6.8 $\mu$g/l
MDL = 13.7 $\mu$g/l

**B. Outfall 001 - Chlorine Limitations**

Effluent limits were calculated for chlorine following the TSD, in same manner as described for arsenic.

Step 1: Calculate Waste Load Allocations (WLAs)

The most stringent applicable water quality criteria for chlorine is 2.0 $\mu$g/l (Alaska Water Quality Standards). Per the TSD, where State water quality criteria are reported as a single value (and therefore, only one WLA exists), the WLA should be considered chronic.

So, for chlorine in Outfall 001,

$WLA_{chronic}$ = chlorine criteria = 2 $\mu$g/l

(since there is no mixing zone and background receiving water concentration is assumed to be zero for chlorine, the criteria is the WLA)

Step 2: Calculate Long-Term Average (LTAs) concentrations.

The chronic WLA is converted to a LTA concentration using Table 5-1 of the TSD:

LTA = WLA * conversion factor from Table 5-1

The conversion factor depends upon the CV and the probability statistic used to account for effluent variability.

CV = 0.6 (default CV value recommended by the TSD when sufficient effluent data is unavailable to calculate a CV)
per the TSD, the 99th percentile statistic is used for calculation of LTAs

from Table 5-1:

$LTA_{chronic}$ = 0.527 * $WLA_{chronic}$ = 0.527 * 2 = 1.054 $\mu$g/l

Step 3: Calculate Maximum Daily and Average Monthly Effluent Limits

Since have only one LTA, then that LTA is used to calculate the maximum daily limit (MDL) and average monthly limit (AML). The MDL and AML are calculated from Table 5-2 of the TSD as follows:

MDL = LTA * conversion factor from Table 5-2
AML = LTA * conversion factor from Table 5-2

The conversion factors depends upon the CV, the probability statistic used to account for effluent variability, and in the case of the AML, the number of samples collected per month.

CV = 0.6
per the TSD, probability basis = 95th percentile for the AML
Probability basis = 99th percentile for the MDL
samples per month = 4 (based on permit requirements)

from Table 5-2:

MDL = LTA * 3.11 = 1.054 * 3.11 = 3.28 $\mu$g/l
AML = LTA * 1.55 = 1.054 * 1.55 = 1.64 $\mu$g/l

Rounding to two significant figures, the chlorine limits become:

MDL = 3.3 $\mu$g/l
AML = 1.6 $\mu$g/l